AQUATIC INVERTEBRATES AND HABITAT OF POTTER CREEK

August 10, 2000

A report to the Montana Department of Environmental Quality

by

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INTRODUCTION

This report summarizes data generated from a single aquatic invertebrate sample taken from Potter Creek, a tributary of the Shields River. The sample was collected by personnel of the Montana Department of Environmental Quality (MT DEQ) using the sampling protocol recommended by Bukantis (1998). In addition to the benthic sample, habitat parameters were evaluated using the "Macroinvertebrate Habitat Assessment Field Form" for streams with glide/pool prevalence. Analysis of invertebrates was accomplished by applying the method recommended by Bollman (1998) for streams of western Montana. The method uses a multimetric battery to evaluate disturbance to biotic integrity. A thorough description of the analytic protocol and rationale for its application may be found in numerous reports to MT DEQ by this author.

RESULTS AND DISCUSSION

Table 1 itemizes the evaluated habitat parameters and shows the assigned scores for each. Habitat conditions were judged nearly optimal; benthic substrate diversity was

Table 1. Stream and riparian habitat assessment for a site on Potter Creek. August 10, 2000. Since incomplete data were provided, the score is based only on parameters for which evaluations were available.

Max. possible score	Parameter	Potter Creek
20	Bottom substrate	15
20	Pool substrate char.	16
20	Pool variability	10
20	Channel alteration	20
20	Sediment deposition	16
20	Channel sinuosity	15
20	Channel flow status	16
20	Bank vegetation	8 / 8
20	Bank stability	n.a.
20	Vegetated zone	n.a.
160	Total	124
	Percent of maximum	77.5
	CONDITION*	OPT

*Condition categories: Optimal > 80% of maximum score; Sub-optimal ; 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

judged to be sub-optimal. Pools were also not very diverse in morphology. Moderate fine sediment deposition was reported. Vegetative protection was judged sub-optimal due to a lack of woody riparian plants. Neither streambank stability nor the extent of the riparian zone was evaluated.

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on Potter Creek partly supports designated uses and exhibits moderate impairment of biotic health. Ephemeroptera taxa richness was lower than expected for a foothill stream, and no Plecoptera taxa were present in the sample. The proportion of tolerant taxa greatly exceeded expectations. No sensitive taxa were collected.

Table 2. Metric values, scores, and bioassessment for a site on Potter Creek. August 10, 2000. The Montana Valley and Foothill Prairies reference, as revised by Bollman (1998), was used.

	Potter Creek
METRICS	**METRIC VALUES**
Ephemeroptera richness	2
Plecoptera richness	0
Trichoptera richness	6
Number of sensitive taxa	0
Percent filterers	10
Percent tolerant taxa	78
	METRIC SCORES
Ephemeroptera richness	1
Plecoptera richness	0
Trichoptera richness	3
Number of sensitive taxa	0
Percent filterers	2
Percent tolerant taxa	0
TOTAL SCORE (max.=18)	6
PERCENT OF MAX.	**33**
Impairment classification*	**MOD**
USE SUPPORT †	**PART**

The taxonomic and functional composition of the sampled assemblage can be further interpreted. Other useful metrics appear in the appendix to this report. One of these is the modified biotic index, which was within expected limits for this stream. The low richness of mayfly taxa, however, suggests that water quality impairment affected the benthic assemblage. The combination of a reasonable value for the biotic index coupled with low mayfly richness suggests that elevated water temperature was the specific impact. No cold-stenotherms were collected; indeed, several taxa comprising the assemblage prefer warm water temperatures, including the dominant taxon *Tricorythodes*

minutus. This mayfly is also tolerant of fine sediment deposition, for which there is additional evidence. Although 6 caddisfly taxa were collected, 4 of these were animals that are exceptionally tolerant of fine sediments: *Oecetis* sp., *Cheumatopsyche* sp., *Hydropsyche* sp., and *Helicopsyche borealis*. Only 8 "clinger" taxa were present in the sample.

Large-scale habitat features also appear to be disturbed, judging by the absence of stoneflies at the site. Channel alteration, loss of riparian function, and extensive streambank instability can be correlates of low stonefly taxa richness.

Only 2 long-lived taxa were collected; dewatering or other catastrophes may interrupt life cycles at this site.

CONCLUSION

- Taxonomic composition of the sample collected at the Potter Creek site suggests that water quality impairment, perhaps by elevated temperatures affects the benthic community. Both large and small scale habitat disturbances or inadequacies appear to further compromise biotic health at this site.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Unpublished Master's Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

APPENDIX

Taxonomic data and summaries

Potter Creek

August 10, 2000

Aquatic Invertebrate Taxonomic Data

Site Name: Potter Creek
Site ID: 8/10/00

Approx. percent of sample used: 3

Taxon	Quantity	Percent	HBI	FFG
Tubificidae - immature	7	2.12	9	CG
Lumbriculidae	1	0.30	8	CG
Helobdella stagnalis	1	0.30	6	PR
Physidae	37	11.21	8	CG
Hyalella azteca	3	0.91	8	CG
Acari	7	2.12	5	PA
Total Misc. Taxa	**56**	**16.97**		
Baetis tricaudatus	9	2.73	6	CG
Tricorythodes minutus	131	39.70	4	CG
Total Ephemeroptera	**140**	**42.42**		
Brachycentrus occidentalis	10	3.03	1	OM
Helicopsyche borealis	2	0.61	7	SC
Cheumatopsyche sp.	14	4.24	8	CF
Hydropsyche sp.	17	5.15	4	CF
Ochrotrichia sp.	2	0.61	4	PH
Oecetis sp.	1	0.30	8	OM
Total Trichoptera	**46**	**13.94**		
Optioservus sp.	56	16.97	4	SC
Total Coleoptera	**56**	**16.97**		
Tabanidae	2	0.61	8	PR
Dicranota sp.	3	0.91	3	PR
Total Diptera	**5**	**1.52**		
Cricotopus sp.	10	3.03	7	CG
Parametriocnemus sp.	1	0.30	5	CG
Rheotanytarsus sp.	1	0.30	6	CF
Thienemannimyia Gr.	3	0.91	6	PR
Tvetenia sp.	12	3.64	5	CG
Total Chironomidae	**27**	**8.18**		
Grand Total	**330**	**100.00**		

Aquatic Invertebrate Summary Data

Site Name: Potter Creek **Site ID: 8/10/00**

TOTAL ABUNDANCE	330
Ephemeroptera + Plecoptera + Trichoptera (EPT) abundance	186
TOTAL NUMBER OF TAXA	22
Number EPT taxa	8

TAXONOMIC GROUP COMPOSITION

GROUP	#TAXA	ABUNDAN	PERCENT
Misc. Taxa	6	56	16.97
Odonata	0	0	0.00
Ephemeroptera	2	140	42.42
Plecoptera	0	0	0.00
Hemiptera	0	0	0.00
Megaloptera	0	0	0.00
Trichoptera	6	46	13.94
Lepidoptera	0	0	0.00
Coleoptera	1	56	16.97
Diptera	2	5	1.52
Chironomidae	5	27	8.18

RATIOS OF TAX GROUP ABUNDANCES

EPT/Chironomidae	6.89

FUNCTIONAL FEEDING GROUP (FFG) COMPOSITION

GROUP	#TAXA	ABUNDAN	PERCENT
Predator	4	9	2.73
Parasite	1	7	2.12
Collector-gatherer	9	211	63.94
Collector-filterer	3	32	9.70
Macrophyte-herbivore	0	0	0.00
Piercer-herbivore	1	2	0.61
Scraper	2	58	17.58
Shredder	0	0	0.00
Xylophage	0	0	0.00
Omnivore	2	11	3.33
Unknown	0	0	0.00

RATIOS OF FFG ABUNDANCES

Scraper/Collector-filterer	1.81
Scraper/(Scraper + C.filterer)	0.64
Shredder/Total organisms	0.00

CONTRIBUTION OF DOMINANT TAXA

TAXON	ABUNDANCE	PERCENT
Tricorythodes minutus	131	39.70
Optioservus sp.	56	16.97
Physidae	37	11.21
Hydropsyche sp.	17	5.15
Cheumatopsyche sp.	14	4.24
SUBTOTAL 5 DOMINANTS	255	77.27
Tvetenia sp.	12	3.64
Brachycentrus occidentalis	10	3.03
Cricotopus sp.	10	3.03
Baetis tricaudatus	9	2.73
Tubificidae-immature	7	2.12
TOTAL DOMINANTS	303	91.82

SAPROBIC INDICES

Hilsenhoff Biotic Index	4.96

DIVERSITY MEASURES

Shannon H (loge)	2.10
Shannon H (log2)	3.03
Evenness	0.68
Simpson D	0.21

COMMUNITY VOLTINISM ANALYSIS

TYPE	ABUNDANCE	PERCENT
Multivoltine	43	13.11
Univoltine	221	66.89
Semivoltine	66	20.00

	#TAXA	ABUNDANCE	PERCENT
Tolerant	10	257	77.88
Intolerant	0	0	0.00
Clinger	8	112	33.94